

Final  
NAGW-4597  
0000  
024342

3 P.

FINAL REPORT

1.0 General

- 1.1 Date of Report : 7 April 1997
- 1.2 Period Covered : 1 May 1995 through  
30 September 1996
- 1.3 Grantor : The University of Iowa  
Dept. of Physics and  
Astronomy  
Iowa City, IA 52242
- 1.4 Title of Grant : Restoration of Helios Plasma Wave Spectrum  
Analyzer Data
- 1.5 Grant Number : NAGW-4597
- 1.6 Signature : Submitted by:



William S. Kurth

## 2.0 Summary of Work Performed

The purpose of this grant was to complete a University of Iowa data restoration initiative to preserve spectrum analyzer data from the plasma wave investigation on Helios and to provide a minimal access capability to any interested users.

The Helios data have been highlighted as a high-priority for preservation/restoration by the Cosmic & Heliospheric Data Evaluation Panel. Helios 1 was launched in December 1974 and returned data for 11 years. Helios 2 was launched in January 1976 and returned data for about five and one-half years. Both had perihelia near 0.3 AU and aphelia near 1 AU. The Helios plasma wave data have been used to show that the intensities of virtually all known types of heliospheric plasma wave phenomena including Langmuir waves, ion-acoustic waves, and whistler modes increase with decreasing heliospheric radial distance and are the sole source of such conclusions. Certainly, this data set will be important for planning and carrying out both a Solar Probe mission and a Mercury Orbiter mission and will be crucial to understanding how to relate Solar Probe or solar wind measurements near Mercury to wave results to 1 AU. Prior to Solar Probe or Mercury Orbiter, and in the event such missions are not flown, the Helios plasma wave data provide the only wave observations in to 0.3 AU.

Helios data were originally archived in the form of microfilmed plots; while these were deemed to be reasonable reduced data products when they were archived, most researchers now consider such hardcopy archives as virtually useless or extremely limited for use in additional studies.

This effort was initiated under the auspices of The University of Iowa with no funding from NASA or other federal agencies. We successfully captured digital data from the plasma wave spectrum analyzers from Helios 1 and 2 by copying the original 7-track computer tapes to 4mm DAT. Even though DAT tapes are not considered to be an archival medium, we felt confident that we had saved these data from the immediate losses due to deteriorating tapes and the diminishing possibility for migration to a more modern medium other than the original 7-track tapes. However, the data analyses of these data were carried out on our old, long extinct Univac 418 system, hence, virtually none of the software to access the data existed for our current workstations. The bits were there, but there was no way to access them.

The continued effort, under auspices of Grant NAGW-4597 includes:

1. Document the data format, instrument characteristics, and other aspects of the investigation to a level which would enable a reasonably-experienced space physics data analyst to be able to understand the data.
2. Write code to enable the extraction of peak, average, Vdiff, and snapshot data from the Helios 1 and 2 E5A (Gurnett) plasma wave spectrum analyzer from the 4mm DAT tapes in calibrated form.

3. Write the data to CD-Write Once (CD-WO) media. The total volume of the Helios data sets are several GB. We extracted the above data and wrote CD-WO files with a simplified format. The total number of CDs is 5 for Helios 1 and 8 for Helios 2. These CDs each have ASCII files included which describe the data, the calibration, and other aspects of the investigation which would be required by a potential data user.

4. Provide on-line access to the data through the SPDS node at the University of Iowa. These data now exist either on-line or near on-line (can be mounted upon request) and accessed through the University of Iowa's *das* data analysis system which allows a user to specify a time period and plot the data required via a Web-based plot specification form. URLs for two versions of this form are:

<http://www-pw.physics.uiowa.edu/~wsk/helios/das-helios.html>

<http://www-pw.physics.uiowa.edu/~wsk/helios/das-hist.html>

The first form generates a color frequency-time representation of the data. The second form generates a multi-channel "strip-chart" style plot.

5. We plan to deliver a copy of the CD-WO disks to NSSDC shortly. The programmer responsible for this project had to leave prematurely and we are only now making final edits to the documentation prior to cutting a final set of CDs from the original set we now have at Iowa. We anticipate these will be ready to ship to NSSDC within a month.